The key to competitiveness

Information Processing

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Today, intelligence is in transition. Trade and economic competitiveness issues are equally as important to national security as military competitiveness issues. The question becomes how can US intelligence effectively contribute to these issues, especially in the area of international competitiveness between US industry and foreign competitors.

This has been difficult for the Intelligence Community, which has had at best a checkered history in assisting US industr [redacted] (b)(1) (b)(3)(c) (b)(3)(n) This becomes an increasingly vexing problem when one considers the transnational trend of businesses today. The analytical abilities of the Intelligence Community could be brought to bear on the problem, analyzing competitiveness strengths and weaknesses in the marketplace, [redacted] (b)(1) (b)(3)(n)

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A Different Work Force

This interchange helped illuminate an area to which the intelligence business may be able to contribute. The story begins with a good look at the nature of our work force. It is getting younger. That is not saying much, because we are measuring this using a sliding scale, as we get older. But it is saying something because the computer generation, which we expect to pick up the gauntlet, has been brought up differently than today's managers.

To many, this is a frightening thought. There are those in industry who feel today's young people are not motivated. Today's college graduates are better educated than their predecessors. While they are willing to work just as hard or harder than their parents' generation, their goals and the motivating influences toward these goals are different.

In October 1988, *The Wall Street Journal* ran a front-page story confirming this view.[1] It stated that young people *are* strongly motivated—to their careers, their family, their immediate supervisors, but not to salary or some overarching corporate or government objective. The bottom line was that US industry needed to adapt its business practices to their concerns.

The most interesting difference is that many of the brightest young people believe that their

[1] *The Wall Street Journal*, 26 October 1988, p. 1.

careers are better served through mobility among assignments, rather than within one narrow career path. This is evident in CIA. Bright analysts spend about two or three years in an assignment, believe they have gotten about 90 percent out of it, and look around for a new challenge. Not necessarily outside CIA, but in a different, often unrelated job.

Tbis is significant because probably nowhere more than in the intelligence business is institutional memory more important. It is clear that managers must somehow reconcile these apparently conflicting realities. The answer to this turns out to be the key to doing a better job in intelligence [redacted] The solutions are doable, and they play to our strengths, both as Americans and as technologists.

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The plan is fairly simple. First, understand that our best employees are apt to be with us for only a short time. Managers should not despair when a valuable person leaves. You have to get the most out of them while they are available, and always expect that they may soon depart. Because of this, we need to realize that institutional memory has to be preserved not in the form of neurons in our employees, but in the form of algorithms, magnetic domains, and silicon.

Platforms of Knowledge

We need to provide an environment where a bright young worker hits the ground running by having the accumulated knowledge needed for his job at his finger tips and the communications and processing horsepower to take efficient advantage of it. He then starts his assignment on a large platform of knowledge, builds on this during his tenure, and leaves a bigger base, so that his successor picks up where he left off.

The philosophy is simple. To put it into practice requires a little thinking about what is in this platform of knowledge. And here is where perhaps the Intelligence Community has an advantage. For example, the Intelligence Community has always been aware that its data come in various compartments. This is broken down in terms of classifications, Confidential through Top Secret, and by types of source—such as COMINT, HUMINT, and SIGINT. Each has its own handling procedures and yearly evaluations. So, we naturally have a good idea of where our information comes from and its relative worth.

Those of us who have looked into how data are used in the Intelligence Community have noticed that usefulness of data begins with its accessibility. Data at one's desk is most useful. If one has to go across the hall to a safe, its use is down about an order of magnitude. And if it is in another buildling, it is down another. This can hurt, because some of our best, most sensitive information is controlled most tightly, ensuring that it will not be used as effectively as it should be.

A guiding principal ought to be to make the acquisition of data by our employees as efficient as possible, preferably at the analyst's desk, in electrical form, with full fidelity, and within 10 seconds.

Unfortunately, we cannot meet these objectives for all data types today. But even though we do things so inefficiently, some little things we can do can make a big difference.

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Building Pyramids

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The (b)(3)(c) system is but one piece in an overall plan for information processing for technical intelligence. (b)(3)(c)

(b)(3)(c) But while we have justified it as a set of S&T tools, we believe it will have broad application, once its usefulness has been demonstrated for S&T.

(b)(3)(c) an architecture for tools that is founded on the observation that the fundamental job of the analyst is to sift through large amounts of data, select a subset for further scrutiny, and produce a concise report for his consumers. This results is a data "pyramid" composed of three basic layers—data, analysis, and reporting. Computers and modern information management systems offer the potential to provide the analyst a significantly larger amount of data for his analysis.

At the bottom of the pyramid, data flow in from a wide variety of sources. Thus, the bottom layer should contain the tools to build automatically integrated, all-source data bases. Immediately above this are the tools to assist the analyst in recognizing alerts, anomalies, and trends appropriate to his analytical task. Together, these bottom two layers form the basis for the "platform of knowledge" or "institutional memory."

Sitting on top of this analytical base are the tools that allow the analyst to evaluate tbe alerts and trends and to organize the ideas into well-structured arguments. Tbis, in turn, forms the base for the production of the report, assisted by such

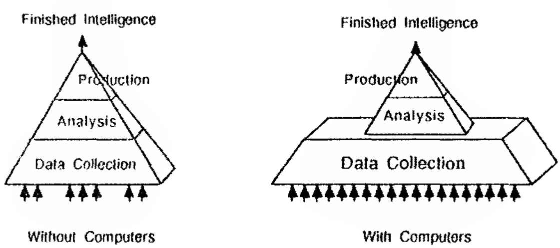

Figure 1

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production tools as integrated graphics and publishing aids. Each of these layers has been described in terms of building blocks. These have formed the basis for the acquisition of existing tools [redacted] (b)(3)(c) and integrating them into this analytical environment. Where tools do not exist, it defines the requirements for R&D. Most of these blocks are being addressed [redacted] (b)(3)(c)

While this may look a little like pie in the sky, 10 years ago this could not have been contemplated. Ten years from now, this will be old hat. We need to push hard now for these tools. We cannot wait for these techniques to be perfected before we start preparing data for them. In the [redacted] (b)(3)(c) effort, [redacted] (b)(1) (b)(3)(n) The hard part is going back to create the historical data base that is needed before the system is really useful.

Before these data are useful, they need to be in electrical form. Our priority ought to be to make sure all data passing through our hands now are saved in electrical form, even if they are not immediately retrievable in the way we would like. There is a surprising amount of data in electrical

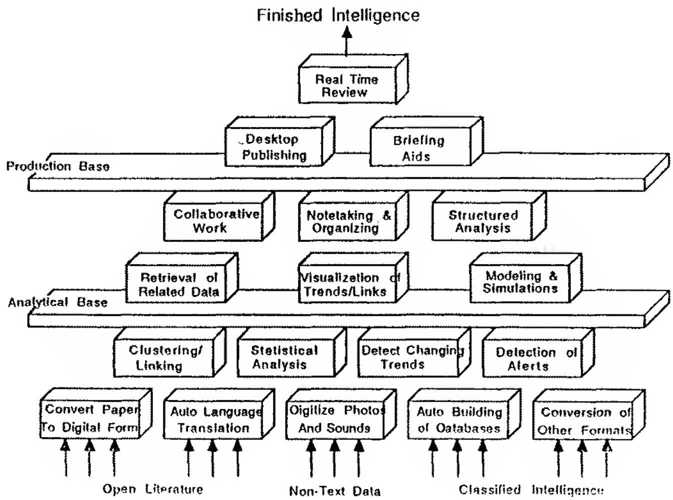

Figure 2

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form somewhere in the process, even if just in a word processing or typesetting program. However, now we essentially throw out 99 percent of all our knowledge, thus relegating it to storage forms that guarantee that it will never be part of future analysis. Putting a paper copy on our book shelf is tantamount to throwing it away. Putting it on microfiche is even worse; its quality is often so poor that it can never be OCRed.

Need for Electrical Data

There are two reasons why it is important to put information in electrical form. First, because of the changing nature of our work force, only data in electrical form stand a chance of becoming a part of our institutional memory.

Second, US researchers, on the average, have an unjustified sense of their ability to be competitive without outside help. The short way of saying this is that we suffer from a severe case of "not invented here." The Japanese make it a national priority to acquire foreign technology for domestic goals.

Recently, a US company providing translations of Japanese technical journals just threw in the towel for lack of a market. It did this despite the general perception that the Japanese are ahead of us in many areas of technology.

Cultural difference or not, US researchers will take advantage of outside developments *if* the information is made available easily and seamlessly with other information. [redacted]

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Suppose you wanted to store electronically all books published in the US, which is roughly 100 books a day, averaging 250 pages each. That is only about 50 Mbytes of ASCII per day—about 5 percent of the amount of data on one compact audio disk. Even if you want to store a compressed digital image of the pages, that is less than two orders of magnitude more.

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[redacted] Perhaps the greater technical challenge today is the communications. There is an erroneous belief that text processing presents only a low data rate requirement. [redacted]

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[redacted] remembering the [redacted] schematic for how analysis will be done in the future, you can see that the primary interactions with the vast quantities of raw data will be by the computer-driven shells and inference engines that will be precorrelating and digesting the information for the analyst. And this ideally should be running at computer speeds, not at typing speeds.

But this, too, is coming along. This fits nicely into a recent proposal for a nationwide ultra-high-speed bus for technical communications.

Information Services

To get from here to where we want to go is going to take a coordinated effort from all of us. The most important thing to do right now is to stop throwing information away, even if it cannot be used effectively. For example, if the only access to some information is by paper, it may be better to save a digital copy of the paper and await further developments in optical character recognition. When that does come along, the conversion to usable ASCII text can be done in background at little cost.

The government has a big piece of the responsibility. We need to store the vast amounts of

taxpayer-paid-for research and to make it available to the appropriate people. There are services today, such as DTIC, which save abstracts and keywords for government-funded research. These are a help. But they really are not research aids. Keywords and abstracts are relics developed for an age when computers and communications were in their infancy. We need full access to text and equations and graphics—within 10 seconds of our query.

That is the easy part. Doing the job right requires some fundamental changes in the way we gather and sell information. CD ROMs have not lived up to their potential of making a lot of information widely available. While it may only cost a few dollars to reproduce a disk, there is not a lot of low-cost data around to distribute. An encyclopedia on a disk is about $1,000 a copy. Online data bases are not cheap, either. Can you imagine having your inference engine running overnight on a problem and finding out that you have run up a $5,000 bill?

Ideally, these information services have to at least meet costs and make a little profit. And when they are used only a little, the per-use charge ends up being significant. But if these sources are used in high-speed, automatic, real research ways, the numbers of accesses should go up by orders of magnitude, and the cost per access presumably would go down by orders of magnitude. This is a bit of a chicken and egg thing. And the government may have to provide some guarantees to get it started.

When we are really serious about it, there are even more fundamental changes we could make. Probably the most radical changes suggested are a redefinition of the Library of Congress and a change in copyright laws that requires that nothing could be copyrighted unless it is provided to the copyright office in usable electrical form, with some agreement on its distribution.

Today's educators are asking why the US can have such poor science education in grade and high schools but the best graduate schools in the world? A good part of the answer lies with the importance we attach to the quality of the staffs and the fact that our graduate schools receive the best equipment available.

Now that competitiveness is a national security issue, we need to provide our employees with better information sources and processing tools. The US is the clear leader in the development of the basic technologies needed for this, namely large data storage and retrieval, communications, and the development of inference-generating analytical methodologies. If we are to regain the leadership of high-tech trade, we have to take advantage of these strengths.

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